

A New Triacanthodid Fish, *Triacanthodes indicus*, from the Indian Ocean

Keiichi Matsuura

(Received May 17, 1981)

Abstract *Triacanthodes indicus*, a new triacanthodid fish collected from the south-western Indian Ocean, is described and figured from 13 specimens. This species is clearly separated from *T. anomalus* and *T. ethiops* by having much larger olfactory organs. The new species represents the first record of the genus from an oceanic region.

The genus *Triacanthodes* is one of the most primitive members of the tetraodontiform family Triacanthodidae, and has been represented by only two species, *T. anomalus* (Temminck et Schlegel, 1850) and *T. ethiops* Alcock, 1854. The former has been known only from the southern part of Japan and the coast of the Asian mainland from South Korea to Hainan Island (Bleeker, 1865; Günther, 1870; Jordan and Fowler, 1903; Kamohara, 1937a, b, 1952, 1958, 1964; Chyung and Kim, 1959; Anonymous, 1962; Tyler, 1968), while the latter has been reported from both the western Pacific and Indian Oceans (Günther, 1880, 1887; Barnard, 1927; Fraser-Brunner, 1941; Kamohara, 1943, 1961; Smith, 1949; Smith and Smith, 1963; Tyler, 1968).

Thirteen specimens of *Triacanthodes* were recently collected from the Saya de Malha Bank in the south-western Indian Ocean by trawling at depths of 92~206 m. They closely resemble *T. anomalus* and *T. ethiops* in many characters, but are distinguishable from the two species by having distinctly larger olfactory organs. These specimens are described and figured below as a new and third species of the genus.

Methods

The methods for counts and measurements follow Tyler (1968) with the following additions: olfactory organ diameter, the greatest width of the olfactory organ; distance between olfactory organs, the least measurement between the mesial edges of the olfactory organs (Fig. 1).

The following institutional abbreviations are used: ANSP, Academy of Natural Sciences of Philadelphia; BMNH, British Museum (Natural

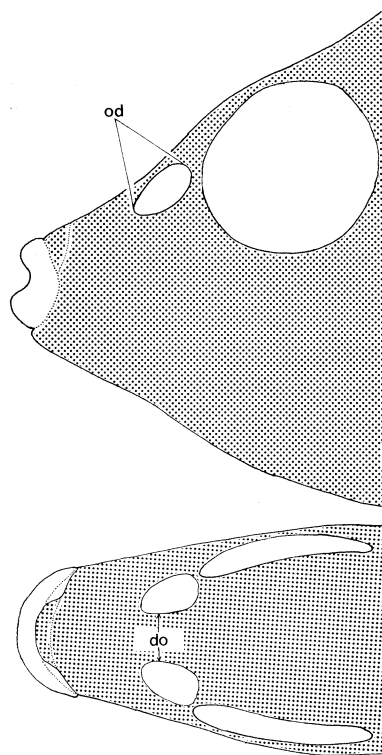


Fig. 1. Diagram showing squamation (stippled area) and method for measurements of olfactory organ diameter (od) and distance between olfactory organs (do) in *Triacanthodes indicus*, sp. nov.

History); CAS, California Academy of Sciences; HUMZ, Laboratory of Marine Zoology, Faculty of Fisheries, Hokkaido University; KSHS, Kochi Senior High School; NSMT-P, National Science Museum (Natural History Institute), Tokyo; RMNH, Rijksmuseum, van Natuurlijke

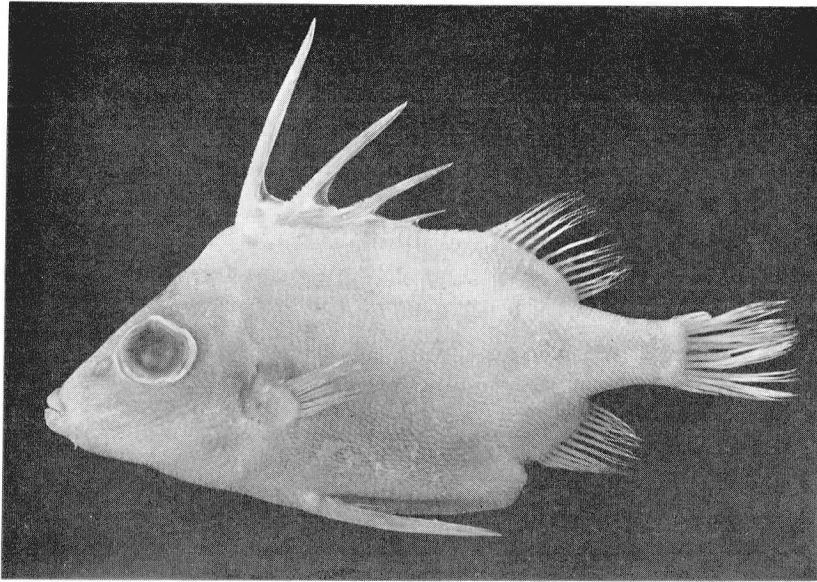


Fig. 2. Holotype of *Triacanthodes indicus*, sp. nov., 110.6 mm SL, Indian Ocean, NSMT-P 19160.

Historie; RUSI, J. L. B. Smith Institute of Ichthyology, Rhodes University; SAM, South African Museum; SU, Stanford University specimens now at California Academy of Sciences; USNM, Division of Fishes, National Museum of Natural History, Smithsonian Institution; and ZUMT, Department of Zoology, University Museum, University of Tokyo.

Comparative material

Triacanthodes anomalus: 36 specimens, 42.2~104.6 mm SL (standard length). Japan: HUMZ 49385, 49547~49548, 49550~49551, 49553~49554, 52188, 52299, 70493; KSHS 18172; RMNH 25399 (lectoparatypes selected by Boesman (1947: 211)); ZUMT 18813~18816, 21763, 23859~23860, 26805, 26883, 31591, 33766~33767, 49596, 51063. China: ANSP 101253; ZUMT 51228, 51668, 52235. Formosa: SU 23538, 49435.

Triacanthodes ethiops: 20 specimens, 16.8~83.3 mm SL. Philippines: USNM 93488, 93491, 93493~93495. Indonesia: BMNH 1879.5.14.572. Africa: ANSP 103286; BMNH 1939.5.24.1840-4; RUSI 12759; SAM 13085.

Triacanthodes indicus, sp. nov. (Figs. 2, 3)

Holotype. NSMT-P 19160, 10°35'S, 61°35'E,

depth 96~98 m, bottom temperature 26.2°C, 4 December 1978.

Paratypes. NSMT-P 19726, 10°44'S, 61°32'E, depth 92~94 m, 5 December 1978; NSMT-P 19727, Saya de Malha Bank, no collecting date; HUMZ 73174~73177, 10°48'S, 60°55'E, depth 125 m, 4 September 1977; HUMZ 73403~73404, 73406, 11°28'S, 61°13'E, depth 176 m, 30 August 1977; HUMZ 73460~73461, 11°20'S, 60°43'E, depth 147 m, 2 September 1977; HUMZ 81501, 10°46'S, 61°05'E, depth 125 m, 10 December 1978.

Diagnosis. A member of the genus *Triacanthodes* with the following characters: olfactory organ diameter always larger than distance between olfactory organs (Fig. 4); eye diameter smaller than snout length (Fig. 5); body depth slightly less than that of other two species of the genus (Fig. 6): 40.3~45.8% SL in the new species, 46.3~61.6% SL in *T. anomalus* and 41.7~54.3% SL in *T. ethiops*.

Description. Anal fin rays 13. Caudal fin with 12 rays, the uppermost and the lowermost rays unbranched. Vertebrae 8+12=20. Other counts and proportional measurements are shown in Tables 1 and 2.

Body compressed and rather deep, the depth nearly equal to or slightly greater than head length. Interorbital space slightly convex or

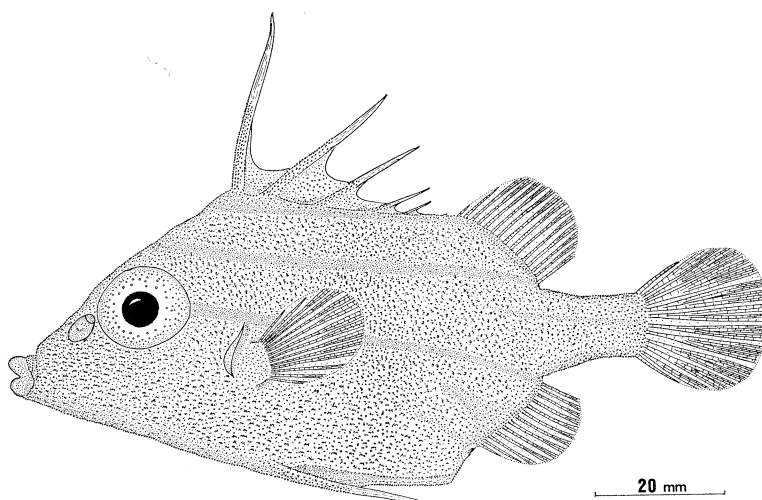


Fig. 3. Paratype of *Triacanthodes indicus*, sp. nov., 92.6 mm SL, Indian Ocean, HUMZ 73404.

flat. Eye diameter slightly less than snout length. Gill opening large, reaching ventrally to between levels of two-thirds down pectoral base and ventral edge of pectoral base. Pseudo-branch extending ventrally below the lower edge of pectoral base. Mouth small, terminal. Lips thin, mid-dorsal part of upper lip with an isolated patch of scales (Fig. 1) but lower one without scales. Both jaws with conical teeth in two series, with the inner series reduced to

few isolated teeth (Fig. 7A). Dorsal spines gradually decreasing in size posteriorly, the last spine minute and buried in skin. Proximal one-half to three-fifths of dorsal spines covered with spinulose scales which are slightly enlarged on the lateral sides of the first and second dorsal spines. Basal part of spiny dorsal fin membrane with a few isolated spinulose scales. Ventral surface of pelvis covered with scales,

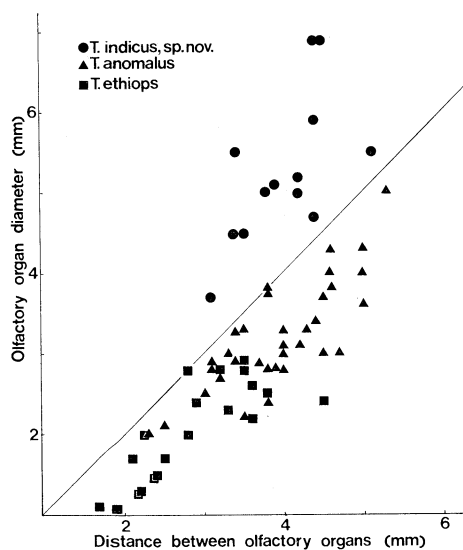


Fig. 4. Relationship of olfactory organ diameter and distance between olfactory organs in the three species of *Triacanthodes*.

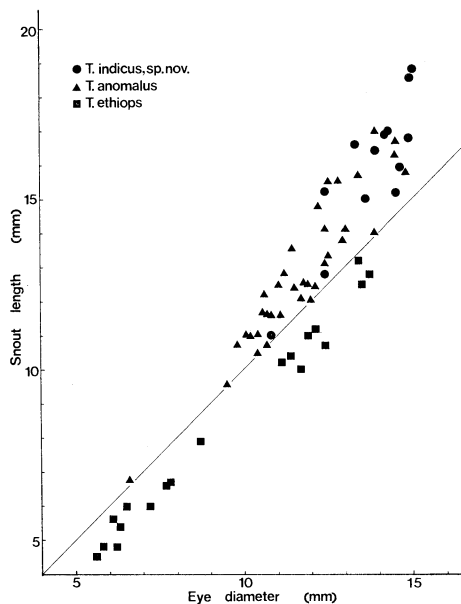
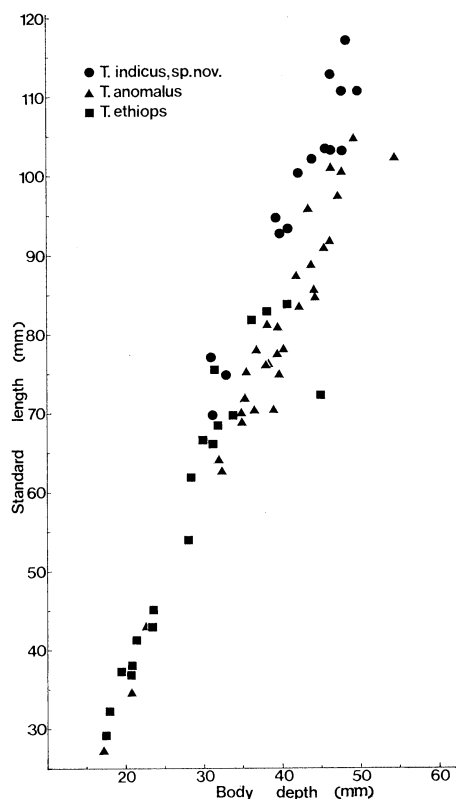


Fig. 5. Relationship of snout length and eye diameter in the three species of *Triacanthodes*.

Table 1. Counts of *Triacanthodes indicus*, sp. nov.

Catalogue number	Holotype		Paratypes													
	NSMT-P	NSMT-P	NSMT-P	HUMZ	HUMZ	HUMZ	HUMZ	HUMZ	HUMZ	HUMZ	HUMZ	HUMZ	HUMZ	HUMZ	HUMZ	HUMZ
Sex	19160 Female	19726 Male	19727 Female	73174 Male	73175 Female	73176 Male	73177 Male	73403 Female	73404 Female	73406 Female	73460 Female	73461 Male	81501 Female			
Dorsal fin	VI-15 14	VI-15 13	VI-15 14	VI-15 14	VI-15 14	VI-16 14	VI-16 13	VI-15 14	VI-15 14	VI-15 13	VI-16 13	VI-15 14	VI-15 14			
Pectoral fin	I, 1	I, 1	I, 1	I, 1	I, 1	I, 1	I, 1	I, 1	I, 2	I, 2	I, 1	I, 1	I, 1			
Pelvic fin	17	16	18	15	17	18	20	18	17	18	15	17	19			
Gill rakers	11	11	10	12	10	11	11	10	12	11	10	12	11			
Olfactory lamellae																
Upper jaw teeth																
outer row	14	16	16	16	12	16	18	15	13	13	15	13	15			
inner row	1	2	3	2	2	1	3	2	1	2	2	1	1			
Lower jaw teeth																
outer row	22	18	19	18	20	17	17	18	13	18	19	21	15			
inner row	2	2	4	2	2	3	5	2	1	2	2	2	2			

Fig. 6. Relationship of standard length and body depth in the three species of *Triacanthodes*.

distinctly tapering to a point posteriorly, much wider anteriorly between pelvic spines than posteriorly. Pelvic spines long and stout, their proximal one-half to three-fourths covered with spinulose scales which become enlarged dorsally on pelvic spines and form low retrorse barbs. Soft dorsal and anal fins rounded, base of former longer than that of the latter. Caudal fin rounded posteriorly. Pectoral fin short and fan-like in shape.

Anterior part of each scale with many narrow ridges forming rings, posterior part with three or four spines in a row (Fig. 7B). These spines become branched distally in large specimens.

The first toothed upper pharyngobranchial with eight teeth in a row (Fig. 7C).

Color of defrosted specimens. Ground color of body yellowish light pink. Along dorsal edge of body a yellow line running from origin of spiny dorsal fin to posterior end of soft dorsal fin. A distinctive longitudinal yellow line extending from about midway between eye and

Table 2. Measurements expressed as percentage of standard length in *Triacanthodes indicus*, sp. nov.

Catalogue number	Holotype		Paratypes															
	NSMT-P 19160 Female 110.6	NSMT-P 19726 Male 102.6	NSMT-P 19727 Female 103.3	HUMZ 73174 Male 103.4	HUMZ 73175 Female 93.2	HUMZ 73176 Male 117.0	HUMZ 73177 Male 112.7	HUMZ 73403 Female 77.0	HUMZ 73406 Female 92.6	HUMZ 73406 Female 69.6	HUMZ 73460 Female 100.3	HUMZ 73461 Male 94.8	HUMZ 81501 Female 104.2					
Sex																		
Standard length (mm)																		
Head length	35.5	36.4	37.2	38.7	38.6	37.3	38.6	41.0	38.6	39.7	38.1	37.9	37.9					
Snout length	14.4	16.2	16.4	16.3	16.3	15.9	16.7	16.6	16.4	15.5	16.4	15.8	16.1					
Eye diameter	13.3	13.0	13.7	13.7	13.3	12.7	13.3	16.1	15.7	15.8	13.9	14.3	14.3					
Postorbital length	9.9	9.4	9.4	9.7	9.7	8.4	9.1	9.5	7.8	7.8	8.0	8.0	8.6					
Interorbital width	8.6	9.9	8.1	10.3	9.7	9.4	11.1	9.6	9.3	10.2	9.4	10.1	10.9					
Gill opening length	10.3	9.4	10.6	9.8	9.5	10.6	12.4	10.9	12.0	10.9	12.5	10.8	11.2					
Snout to spiny dorsal origin	41.7	44.1	43.9	45.5	43.8	43.6	43.7	47.9	45.8	48.3	43.2	45.0	44.5					
Body depth	44.9	42.9	44.6	44.2	43.9	41.3	41.0	40.3	43.1	44.8	42.2	41.5	45.8					
First dorsal spine length	35.9	35.7	35.1	34.4	36.5	31.3	33.5	28.8	29.6	33.3	*	31.2	*					
Length of soft dorsal fin base	19.1	17.1	19.5	*	19.6	17.4	19.5	17.3	18.6	17.5	18.2	19.0	19.8					
Soft dorsal fin height	15.6	14.7	15.9	*	*	11.9	13.5	14.3	13.7	17.0	15.4	14.2	13.9					
Length of anal fin base	12.7	12.7	14.3	12.6	13.5	13.1	12.8	12.5	13.1	12.8	12.7	12.4	13.9					
Anal fin height	14.0	12.2	13.6	12.4	*	*	*	13.5	12.4	10.1	*	11.1	12.3					
Caudal fin length	24.2	25.2	25.2	25.2	*	21.5	24.0	24.9	23.8	24.4	24.2	24.4	*					
Caudal peduncle depth	10.2	10.8	10.0	10.1	9.4	9.1	10.0	9.4	9.4	9.2	10.0	9.8	10.0					
Caudal peduncle length	16.1	17.7	16.2	17.2	15.5	17.8	16.1	16.2	17.0	18.0	16.6	15.6	17.8					
Pelvic spine length	30.7	32.8	32.0	33.2	29.6	*	*	29.5	28.4	*	*	23.5	29.0					
First pelvic ray length	8.8	8.4	6.8	6.6	7.1	3.8	8.7	7.5	8.6	10.1	3.8	*	8.2					
Pelvic width	9.6	7.4	8.2	7.2	8.5	6.3	7.4	7.3	6.9	7.9	9.6	6.3	8.5					
Pelvic length	31.7	31.4	31.7	31.7	30.6	28.2	29.4	29.1	29.7	31.6	31.6	30.1	31.1					
Pectoral fin length	16.6	17.6	17.6	16.6	*	15.8	16.2	15.8	15.4	17.8	17.1	14.3	16.9					
Olfactory organ diameter	4.2	5.1	5.3	5.3	5.4	5.9	6.1	5.8	4.5	4.7	5.1	5.3	5.9					
Distance between olfactory organs	4.0	4.1	3.3	4.9	4.1	3.9	3.9	4.5	3.4	4.5	3.9	4.4	4.4					

* Measurements could not be taken due to damage of specimens.

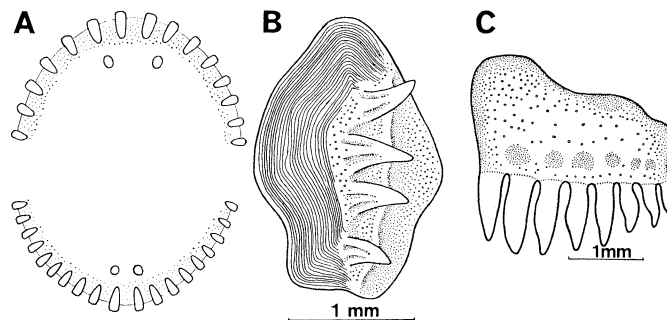


Fig. 7. Dentition (A), mid-body scale (B), and pharyngobranchial (C) of *Triacanthodes indicus*, sp. nov.

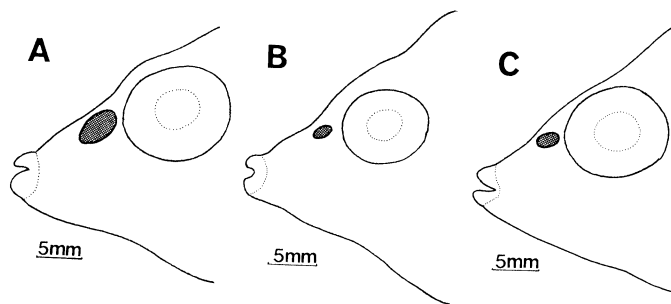


Fig. 8. Diagram showing size differences of the olfactory organs in the three species of *Triacanthodes*. A: *T. indicus*, sp. nov., HUMZ 73403. B: *T. anomalus*, HUMZ 49548. C: *T. ethiops*, USNM 93493.

origin of spiny dorsal fin to posterior end of soft dorsal fin. Another longitudinal yellow line running from posterior margin of eye to pectoral region, and seemingly extending toward base of anal fin, although being obscure posteriorly.

Remarks. According to Tyler's (1968) monograph of the triacanthoids, the new species is readily placed in the genus *Triacanthodes* due to the following characters: the pelvis tapering to a point posteriorly, much wider anteriorly between the pelvic spines than posteriorly; snout shorter than rest of head, its length less than eye

diameter; conical teeth in two series in both jaws; and pseudobranch extending ventrally below the lower edge of pectoral base.

Triacanthodes indicus is more similar to *T. anomalus* than to *T. ethiops* in the relationship between the eye diameter and snout length (Fig. 5) and in the shape of the interorbital region. However, in the number of olfactory lamellae it resembles *T. ethiops* more than *T. anomalus* (Table 3). The number of pharyngobranchial teeth in *T. indicus* is intermediate between those of the other two species of the genus: eight teeth in *T. indicus*, nine in *T.*

Table 3. Frequency distributions of the number of olfactory lamellae in the three species of *Triacanthodes*.

	Number of olfactory lamellae										
	10	11	12	13	14	15	16	17	18	19	20
<i>T. indicus</i>	4	6	3								
<i>T. anomalus</i>						6	8	8	7	1	1
<i>T. ethiops</i>		1	3	8	2	4					

anomalus, and six in *T. ethiops*. The specimens of *T. indicus* were originally frozen and the color pattern has become obscure, especially on the ventral half of body. Thus, it is very difficult to use the coloration of *T. indicus* as an indicator of relationships.

Although *T. indicus* cannot be clearly separated from the other two species of the genus by the characters mentioned above, it is easily distinguishable from them by the olfactory organ. The olfactory organ of *T. indicus* is larger than that of the other two species (Fig. 8): in *T. indicus* the olfactory organ diameter is 2.2~3.2 times in the eye diameter, in *T. anomalus* 2.9~5.1, and in *T. ethiops* 3.7~5.8. There is also a critical difference in the relationship of the olfactory organ diameter and the distance between the olfactory organs. In *T. indicus* the olfactory organ diameter is always larger than the distance between the olfactory organs, but in the other two species the former is less than or equal to the latter (Fig. 4).

The fishes of the genus *Triacanthodes* have been known only from coastal regions, except for *T. ethiops* from the Seychelles Islands listed by Smith and Smith (1963). However, the Seychelles specimen is now considered to be an unidentifiable species of balistid (Tyler, 1968: 132). Thus, the genus is here recorded for the first time from an oceanic region.

Acknowledgments

I wish to thank Drs. Kunio Amaoka of the Laboratory of Marine Zoology, Faculty of Fisheries, Hokkaido University and James C. Tyler of the Division of Environmental Biology, National Science Foundation, for critical reading of the manuscript. My thanks go to Mr. Eiichi Fujii for the donation of specimens designated here as the holotype and paratypes and his advice on the relationship of *T. indicus* and *T. anomalus*.

For the loan of specimens in the collections under their care, I express my thanks to the following persons: Dr. Marinus Boeseman, Rijksmuseum van Natuurlijke Historie; Dr. James E. Böhlke, Department of Ichthyology, Academy of Natural Sciences of Philadelphia; Dr. William N. Eschmeyer, Department of Ichthyology, California Academy of Sciences; Dr. Phillip C. Heemstra, J. L. B. Smith Institute

of Ichthyology; Dr. Alexander P. Hulley, South African Museum; Dr. Takao Igarashi, Laboratory of Marine Zoology, Faculty of Fisheries, Hokkaido University; Dr. Yoshiaki Tominaga, Department of Zoology, University Museum, University of Tokyo; Mr. Takeshi Yamakawa, Kochi Senior High School; Dr. Stanley H. Weitzman and Miss Susan J. Karnella, Division of Fishes, National Museum of Natural History, Smithsonian Institution; Mr. Alwyne C. Wheeler, British Museum (Natural History).

To my wife, Yoko, I extend my heartfelt gratitude for translating the anonymous paper on triacanthodids from Chinese to Japanese.

Literature cited

- Anonymous. 1962. Order Tetraodontiformes. In Fishes of the South China Sea, pp. 1015~1111. Scientific Publ. Agency, Peking, xxxvii+1184 pp., 860 figs. (In Chinese).
- Barnard, K. H. 1927. A monograph of the marine fishes of South Africa. Part 2. Ann. S. African Mus., 21 (2): 419~1065, figs. 1~32, pls. 1~37.
- Bleeker, P. 1865. Atlas ichthyologique. 5. Baudroides, Ostracions, Gymnodontes, Balistes. Frédéric Müller, Amsterdam, 152 pp., 38 pls.
- Boeseman, M. 1947. Revision of the fishes collected by Burger and von Siebold in Japan. Zool. Meded., 28: 1~242, pls. 1~5.
- Chyung, M. and K. H. Kim. 1959. Thirteen unrecorded species of fishes from Korean waters. Korean J. Zool., 2 (1): 2~10, figs. 1~17.
- Fraser-Brunner, A. 1941. Notes on the plectognath fishes.—V. The families of triacanthiform fishes, with a synopsis of the genera and description of a new species. Ann. Mag. Nat. Hist., (11) 7: 420~430, figs. 1~4.
- Günther, A. 1870. Catalogue of fishes in the British Museum. 8. Taylor and Francis, London, xxv+549 pp.
- Günther, A. 1880. Report on the shore fishes produced during the voyage of the H. M. S. Challenger in the years 1873~1876. Report on the Scientific Results of the Voyage of H. M. S. Challenger during the Years 1873~1876, Zool., 1 (6): 1~82, pls. 1~32.
- Günther, A. 1887. Report on the deepsea fishes collected by H. M. S. Challenger during the years 1873~1876. Report on the Scientific Results of the Voyage of H. M. S. Challenger during the Years 1873~1876, Zool., 22: 1~268, pls. 1~66.
- Jordan, D. S. and H. W. Fowler. 1903. A review of the trigger-fishes, file-fishes, and trunk-fishes of Japan. Proc. U.S. Nat. Mus., 25 (1287): 251~

- 286, figs. 1~6.
Kamohara, T. 1937a. A review of the triacanthodid fishes found in the waters of Japan. Annot. Zool. Japon., 16 (1): 5~8, pl. 1.
Kamohara, T. 1937b. Two rare fishes from Prov. Tosa, Japan. Zool. Mag. (Tokyo), 49 (7): 255~258, figs. 1~2.
Kamohara, T. 1943. Some unrecorded and new fishes from Prov. Tosa, Japan. Bull. Biogeogr. Soc. Japan, 13 (17): 125~137, figs. 1~2.
Kamohara, T. 1952. Revised descriptions of the offshore bottomfishes of Prov. Tosa, Shikoku, Japan. Rep. Kochi Univ., Nat. Sci., 3: 1~122, figs. 1~100.
Kamohara, T. 1958. A catalogue of fishes of Kochi Prefecture (Province Tosa), Japan. Rep. Usa Mar. Biol. Stn., 5 (1): 1~76.
Kamohara, T. 1961. Notes on the type specimens of fishes in my laboratory. Rep. Usa Mar. Biol. Stn., 8 (2): 1~9, pls. 1~7.
Kamohara, T. 1964. Revised catalogue of fishes of Kochi Prefecture, Japan. Rep. Usa Mar. Biol. Stn., 11 (1): 1~99, figs. 1~63.
Smith, J. L. B. 1949. The sea fishes of southern Africa. Central News Agency, Ltd., Cape Town, xvi+550 pp., 1232 figs.
Smith, J. L. B. and M. M. Smith. 1963. The fishes

- of Seychelles. J. L. B. Smith Inst. Ichthyol., Grahamstown, 215 pp., 3 figs., 98 pls.
Tyler, J. C. 1968. A monograph on plectognath fishes of superfamily Triacanthoidea. Acad. Nat. Sci. Phila., Monogr. 16: 1~364, figs. 1~209.

(Department of Zoology, National Science Museum (Natural History Institute), 3-23-1 Hyakunin-cho, Shinjuku-ku, Tokyo 160, Japan)

インド洋から採集されたベニカワムキ属の1新種

松浦啓一

インド洋南西部のサヤデマルハバンクから採集されたベニカワムキ属の新種 *Triacanthodes indicus* を記載した。本種は、多くの形質において本属の他の2種、ベニカワムキとシマベニカワムキに似ているが、大きな鼻腔をもつことによって区別できる。本種では、鼻腔径は左右の鼻腔間の距離より明らかに大きい、他の2種では、前者の方が後者より小さいか等しい。

本属魚類は、これまで沿岸域からのみ知られていたが、本報告によって遠洋域にも分布することが明らかになった。

(160 東京都新宿区百人町 3-23-1 国立科学博物館 分館動物研究部)